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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/015,433	12/12/2001	Martin Kranz	5318/CALB/COPPER/PJS	5742
32588	7590	06/15/2004	EXAMINER	
APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050			TRAN, BINH X	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 06/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/015,433

Applicant(s)

KRANZ ET AL.

Examiner

Binh X Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 31 March 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-5, 7-11, 18 and 32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 18 is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-11 and 32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☒ Interview Summary (PTO-413)  
Paper No(s)/Mail Date 6-10-04
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. In view of the appeal brief filed on 3-31-2004, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

#### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-5, 7-9, 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Subrahmanyam et al. (US 6,107,192) in view of Parkhe (US 6,033,482) and Chen et al. (US 6,132,813).

Subrahmanyam discloses a process comprises the step of:

disposing a substrate on a substrate support in a process chamber (Fig 2-4);

exposing the substrate to a pre-cleaning process comprising forming a plasma from the gas mixture consisting of non-reactive gas (i.e. He, Ar) and a reactive gas H<sub>2</sub> (col. 9 lines 50-60).

Subrahmanyam fails to disclose the step of cooling the substrate to a temperature of 100 °C or less. Parkhe teaches to cooling the substrate before activating the plasma in the pre-cleaning process (col. 3 lines 40-67). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Subrahmanyam in view of Parkhe by cooling the substrate because it will stabilize the substrate temperature and result in effective cleaning.

Subrahmanyam and Parkhe differ from the invention by the specific temperature range. However, Parkhe clearly disclose that temperature is a result effective variable and it can be control via heat transfer medium (col. 3 lines 40-50, col. 4 lines 4-15). In a pre-cleaning process, Chen discloses the temperature range between 5-80 °C is effective to remove contamination (read on applicant's range of "100 degree Celsius or

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less" See table 1 in col. 5). The result effective variable is commonly determined by routine experiment. The process of conducting routine experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence it would have been obvious to one having ordinary skill in the art, at the time of invention, to perform routine experiment to obtain optimal temperature as an expected result.

Respect to claim 2, Subrahmanyam discloses the step of electrostatically chucking the substrate to the substrate support member (col. 5 lines 26-30). Respect to claims 3-5, Parkhe discloses cooling the substrate comprises flowing a gas or heat transfer fluid through the substrate support or transferring heat from the substrate through a thermo-electric device (See Fig 1, col. 4). Respect to claim 7, Subrahmanyam discloses the step of etching/removing CuO (i.e. native copper oxide) from the substrate (See col. 9 lines 58-62). Respect to claim 8, Subrahmanyam discloses inductively coupling about 300 Watts to the plasma, and bias the substrate support member with 10 Watts (within applicants' range, See col. 9 lines 55-60). Respect to claim 9, Subrahmanyam discloses reducing native oxides (col. 7 lines 15-20). Respect to claim 32, Subrahmanyam discloses the non-reactive gas is selected from the group consisting of argon, nitrogen and helium (col. 9 lines 56-57).

5. Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Denning et al. (US 6,451,181) in view of Parkhe and Asaka (US 5,236,537).

Denning disclose a process for pre-cleaning aperture on a substrate, the process comprises the step of:

disposing a substrate on a substrate support in a process chamber (Fig 2);

electrostatically chucking the substrate to the substrate support member (col. 6 lines 20-25)

exposing the substrate to a pre-cleaning process comprising forming a plasma from the gas mixture consisting of non-reactive gas (i.e. Ar or Xe) (col. 1 lines 10-30).

Denning fails to disclose the step of cooling the substrate to a temperature of 100 °C or less. Parkhe teaches to cooling the substrate before activating the plasma in the pre-cleaning process (col. 3 lines 40-67). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Denning in view of Parkhe by cooling the substrate because it will stabilize the substrate temperature and result in effective cleaning.

Denning and Parkhe differ from the invention by the specific temperature range. However, Parkhe clearly disclose that temperature is a result effective variable and it can be control via heat transfer medium (col. 3 lines 40-50, col. 4 lines 4-15). In a pre-cleaning process, Asaka discloses the temperature at about 25 °C is effective to remove contamination (read on applicant's range, col. 12 lines 60-65). The result effective variable is commonly determined by routine experiment. The process of conducting routine experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence it would have been obvious to one having ordinary skill in the art, at the time of invention, to perform routine experiment to obtain optimal temperature as an expected result.

Respect to claim 11, Denning discloses the inductively coupling about 300 Watts or greater and biasing the substrate support to 100 Watts or less (within applicant's

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range, col. 13 lines 50-55). Denning teaches to regulate the pressure, but Denning fails to disclose specific chamber pressure value. However, both Denning and Parkhe discloses that pressure is a resulting effective variable by controlling/regulating the chamber pressure (Denning col. 7 lines 1-7; Parkhe col. 4 lines 49-55). In a pre-cleaning process, Asaka discloses a chamber pressure of 0.1 Pa (0.1 Pa = 0.75 mtorr, within applicant's pressure range of "0.5 to 100 mtorr"; See col. 12 lines 60-62). The result effective variable is commonly determined by routine experiment. The process of conducting routine experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence it would have been obvious to one having ordinary skill in the art, at the time of invention, to perform routine experiment to obtain optimal pressure as an expected result.

#### ***Allowable Subject Matter***

6. Claim 18 is allowed.
7. The following is a statement of reasons for the indication of allowable subject matter: The reason for allowance was discussed in previous office action.

#### ***Conclusion***

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X Tran whose telephone number is (571) 272-1469. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G Norton can be reached on (571) 272-1465. The fax phone

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number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Binh X. Tran

**NADINE G. NORTON**  
**SUPERVISORY PATENT EXAMINER**

